CLAIMS

1. An oxide phosphor in particulate form, wherein each particle has a surface region including a vicinity thereof modified so that an elemental composition of the surface region is in a more oxidized state than an elemental composition of an internal region of the particle.

2. The oxide phosphor of Claim 1, having an elemental composition that includes a luminescent center metal able to have a plurality of valence states, wherein the luminescent center metal in the surface region has a higher average valence as compared to the internal region.

3. The oxide phosphor of Claim 2, being an alkaline earth metal aluminate phosphor including europium as a luminescent center, wherein europium in the surface region has a higher average valence as compared to the internal region.

4. The oxide phosphor of Claim 3, wherein in each of the plurality of particles, the elemental composition is substantially $Ba_{1-x}Sr_yEu_zMgAl_{10}O_{17}$, where $0.05 \leq x \leq 0.40$, $0 \leq y \leq 0.25$, $0.05 \leq z \leq 0.30$, and $x-y \leq z$ for

the particle as a whole,

in the particle as a whole, divalent europium accounts for no less than 60% but no more than 95% of all europium, and

in the surface region, divalent europium accounts for no less than 5% but no more than 30% of all europium.

5. An oxide phosphor in particulate form, wherein

each particle has a surface region including a vicinity thereof modified so that an elemental composition of the surface region includes more halogen or chalcogen than an elemental composition of an internal region of the particle.

6. The oxide phosphor of Claim 5, wherein

halogen atoms or chalcogen atoms are chemically bound to the surface region.

7. The oxide phosphor of Claim 6, wherein

fluorine atoms are chemically bound to the surface region.

8. A light-emitting element having one or more phosphor layers made of an oxide phosphor recited in one of Claims 1 and 5.

9. The light-emitting element of Claim 8, wherein within each of the phosphor layers, the oxide phosphor recited in one of Claims 1 and 5 is disproportionally distributed, with more at and near a surface thereof than in an inner region.

10. A plasma display panel having one or more phosphor layers composed of an oxide phosphor recited in one of Claims 1 and 5.

11. A mercury-free lamp having a phosphor layer made of an oxide phosphor recited in one of Claims 1 and 5.

12. A phosphor treatment method, comprising a step of: selectively modifying a surface region, including a vicinity thereof, of individual phosphor particles that constitute a phosphor by (i) forming a highly reactive gas atmosphere by exciting gas that contains reactive gas, and (ii) exposing the phosphor to the gas atmosphere.

13. The phosphor treatment method of Claim 12, wherein the gas atmosphere is in a plasma state.

14. The phosphor treatment method of Claim 12, wherein the gas atmosphere is formed at or close to atmospheric

pressure.

15. The phosphor treatment method of Claim 12, wherein the gas containing the reactive gas is excited by applying energy.

16. The phosphor treatment method of Claim 15, wherein the gas containing the reactive gas is excited by ultraviolet light.

17. The phosphor treatment method of Claim 16, wherein the ultraviolet light is applied to the gas containing the reactive gas without illuminating a surface of the phosphor.

18. The phosphor treatment method of Claim 15, wherein the gas containing the reactive gas is excited by a high-frequency voltage which causes the gas containing the reactive gas to electrically discharge and thereby become excited.

19. The phosphor treatment method of Claim 15, wherein a location at which the energy is applied to the gas containing the reactive gas is separated from a location at which the phosphor is exposed to the gas atmosphere.

20. The phosphor treatment method of Claim 12, wherein the gas atmosphere is formed outside a treatment vessel by (i) introducing the gas containing the reactive gas into the treatment vessel, (ii) applying energy to excite the introduced gas, and (iii) ejecting the excited gas therefrom.

21. The phosphor treatment method of Claim 12, wherein when exposed to the gas atmosphere, the phosphor is in a heated state at a temperature of 300 °C or lower.

22. The phosphor treatment method of Claim 12, wherein the reactive gas includes molecular oxygen, and ozone or monatomic oxygen is formed by exciting the reactive gas.

23. The phosphor treatment method of Claim 12, wherein the reactive gas includes fluorinated gas.

24. The phosphor treatment method of Claim 12, wherein a plurality of kinds of phosphors are processed, and a setting of one of a parameter relating to forming the gas atmosphere and a parameter relating to exposing the phosphors to the gas atmosphere is altered for each kind of

the phosphors.

25. The phosphor treatment method of Claim 12, wherein the gas containing the reactive gas includes rare gas or inert gas.

26. A method for manufacturing a light-emitting element, comprising a step of:

modifying, within each of one or more phosphor layers formed on a substrate, a region at and near a surface thereof by (i) forming a highly reactive gas atmosphere by exciting gas that contains reactive gas, and (ii) exposing the substrate to the gas atmosphere.